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ABSTRACT

This paper examines some of the applications of computers in education, focusing on the political and people problems involved. Through this approach it is hoped that superintendents, principals, data processing specialists, and scholars might develop a better awareness and understanding of how to assess the use of computers in school systems. The paper demonstrates that computers in education must have specific and systematic objectives and be able to demonstrate better ways of allocating resources or making decisions. Planning for computers is also required, and both educational administrators and computer personnel must be aware of the political processes involved in introducing computers into school districts. An awareness that computers have serious consequences inthe politics of school districts should lead educational administrators and computer personnel to see a need to reexamine the assumptions of computers in education and perhaps increase the potential of computers in educational improvement. A bibliography is provided. (Author/DN)

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A Systems Analysis of the Political Problems of Using Computers in Education

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The use of computers in educational administration is continuing to grow. Computers are amazing tools with immense possibilities, and educational administrators who see computers only as oversized calculators have missed the essence of their potential. In the decades ahead, it is expected that the structure, form, and process of education will become different. Computers will play an increasingly important role in changing education and educational administration, but these changes will not be without resistance, conflict, and controversy.

The Quiet Controversy about Computers

One of the areas where educational administrators have a right to question the benefits of computers is their actual and potential uses. Umans has been one of the over-enthusiastic proponents of computers who glibly described the wonderful accomplishments of these machines without also describing the pain-staking political work, the systems work, and the costs necessary to make the big machines work.[1] The glamour of the big machines had been emphasized and many educational administrators were stimulated by the potential of computers only to be awakened too late to the fact that the educational uses of computers also had a myriad of political and cost problems.

Computer fallacies. Grossman was probably one of the first to point out some of the fallacies of the educational uses of computers. One fallacy he identified was the assumption that if all the information about educational problems was collected and stored in computers, then the information could be arranged in such a way as to

solve all educational problems. It was reasonable for Grossman to point out some other fallacies. For example, he stated that computers would provide educational administrators with more information about their districts than they could possibly use and there would also be much data that they would not know how to use.[2] Grossman also felt that computers would provide much useless information and some information would be given to administrators too late to use in many cases.

Information abuses. Another falling out that educational administrators have had with computers was the possibilities of abuses of the school district information collected and stored in the memory, the drums, and the tapes of the computers. It is still possible for persons to misuse school information through the use of remote terminals.[3] School administrators have to guard against such potential abuses. However, until they have been assured of safeguards against abuses, they must approach the use of computers and school management information systems with caution.

Costs and wastes. A third area where computers have failed to reach their educational potential is in cost-effectiveness. Gruenberger thought that computers in business and education were being used wastefully in "make work" situations where their actual and real potential was being ignored.[4] It is incumbent upon educational administrators, data processing directors, and vendors to insure that computer usage is not wasted. They must search for useful work for the computers. Basically, they must insure that computers are asked to solve real educational problems, that the information provided by the computers is readable, and that it is

interpretable so that the administrators can use the computer for more efficient school decisions.

Purpose of the Systems Analysis Paper

This paper is not designed to be a detailed analysis of specific uses of computers in education. Certainly, it will show that computers have utility in educational administration. Its major purpose, however, is to describe the major people problems and the political problems of computers use. To achieve this, it will examine some of the computer applications in education and it will focus on the political problems involved. Through this approach, superintendents, principals, data processing specialists, and scholars should develop a better awareness and understanding of how to assess the use of computers in school systems.

Important Uses of Computers

In examining the uses of the computers, we find that educational information is collected through computers because administrators, teachers, students and parents demand it. Much of the information needed in a school district is of a pragmatic, practical nature. In a sense, the value of computers in education seems to rest with the information required to reduce educational problems to reasonable proportions.[5] The value of computers in education then is based solely on how well the information is structured and how well it solves educational problems.

Data linkages. The potential for linking a data source from one computer to a second data source is greater now than ever before. It is possible to create an all-encompassing information

network with linkage from every class and classroom to the U.S. Office of Education. Although there are broad constitutional questions to be answered about the rights and responsibilities of local, state, federal governments over such uses of these linkages, the information networks are very much in evidence today. Stollar and Boardman reported that the National Educational Finance Project had merged personal income data and educational data of local elementary and secondary school districts throughout the United States.[6] By using the zip code as a key, an Internal Revenue file with tax returns for 1967 was merged with a U.S. Office of Education master file consisting of 93,562 data records of individual schools. The newly merged tape contained information by school of the number of pupils, teachers, and the incomes of the parents based on tax returns classed as under $3,000, $3,000 to $10,000, and over $10,000. The authors reported optimistically:

> "Thus, due to the advent of the zip code and the use of computers, it has been possible to put together a data base consisting of both personal income and educational data. Such information should prove to be valuable to both the educational researcher and the decision-maker."[7]

There was no doubt that the merging of massive data files was a substantial technical achievement for computer technology. Other achievements of information processing were less spectacular. Educational administrators, by necessity, collect and use a great amount of information. This information on students, teachers, and business transactions is for the operation of the school district and is often very detailed. Often it falls into about three different classes and uses. Computer applications at this district level are more often related to the form and definition of the data than to fallacies of the computer. The three categories are:

Pupil/parent information. A great deal of information to identify families, history, and progress of the students can be stored in computers. Attendance, student activities, counseling, and psychological information is collected and disseminated within schools and districts. All such information could be assembled and reported by computers.

Personnel/instructional programs. This class has three basic forms of information; (1) employee information about social security, name, address, and retirement information; (2) qualifications and skills of employees, degrees, course work and certificates; (3) current teaching assignments, subjects, and teaching periods. Codes or class numbers may serve district purposes and also fit computer uses.

Business/finance. The school business office expects to handle invoices, vouchers, and other business of the school district. Categorical aid programs, reimbursements and information about curricular programs are seldom consistent and often require several separate accounting systems. In reality, the tremendous duplication of the accounting systems can be eliminated by the use of computers for all school accounting needs.

More Creative Uses of Computers

Many professionals in the computer field take many computer applications for granted. Reports of the achievements of computers in colleges and universities are very positive even though the financial resources are scarce.

University applications. Educational Testing Service and Princeton University as well as other universities are exploring computers used in teaching chemistry, music, the social sciences, and career guidance. There is a prevailing optimism for the potential of computers in higher education decision-making.[9] A general theme for computers in higher education seems to be to train higher education administrators in the uses of computers and to develop further state-wide plans for computer utilization.

Curriculum and teaching. Gordon reported a rather unique use of computers for evaluating the courses at an U.S. Air Force Staff College. An evaluation instrument was distributed to students at the beginning of each phase of instruction. The instrument contained evaluations of: objectives for the given seminar, readings, content, presentation, organization. A Fortran program used on a time-sharing basis analyzed the instruction in quintiles from high to low providing a profile of the curriculum.[10] Gordon reported this computer application as an excellent instructional feedback system with further refinements being developed to relate student background characteristics to their own evaluations.

Other automated response systems for instruction have also been developed to emphasize rapid feedback to both the student and the instructor. Sandler and Bowles described an easily constructed student response system used for a variety of teaching systems.[11] Additional feedback anonymously given to the instructor, said the authors, would save student embarrassment by not making their reaction to the instructor public and would increase communications to improve learning. The previous

system is rather traditional, but more futuristic automated response systems have been proposed for 1985.

Parker viewed cable television as a two-way tutor not yet in existence. In pursuing goals of life-long learning and opportunities to learn anything the learners desired, Parker proposed a two-way cable television system where learners would be actively practicing responses requested by the television instructor. Students would be interacting with the television instructor through small digital computers where responses would be aggregated so that the instructor could view how his teaching was being accepted by students. Admittedly, this visionary student response system would not cut the costs of education; however, if Parker's goals were achieved, life long learning would increase the number of students and unit costs of education would be drastically reduced.

The People and Political Problems of Computer Use

In this paper, the obstacles against school district applications of computers have been focused on costs, waste, and ineffectiveness. The technology is not questioned. Until the present, hard work and heavy funding have made computers work in education. Outlays for computer installations are still very high and new moneys for the educational uses of computers is fast drying up. To prove their worth in education, computers will have to deliver more efficiency for the same number of dollars.[13] But even more, educational administrators will also have to deal with the resistance of computers by teachers, students, and other administrators.

Political Resistance of computers. One study of the acceptance of computers by administrators, teachers, and pupil personnel workers showed that school personnel do not have unreasonable fears of computers. Among 15 school districts, one-third of which had used computers for five years, a second third used computers for less than five years, and one-third had no experience with computers, 75 teachers, and 75 pupil personnel workers indicated they held similar positive attitudes toward the meanings of computer or data processing terms.[14]

Whether these school personnel served in districts that had extensive or little experience with computers did not significantly affect their attitudes toward computers in schools. The author of the study also collected additional anecdotal information from these school personnel about their feelings toward computers. Although his original attitudinal findings were confirmed, he also found educational administrators to be slightly more favorable toward computers than were teachers. He concluded that as long as the computers remained under-developed and remote from the teachers, there would probably be no great resistance to computers in education. This conclusion still did not consider other political obstacles to computers where they begin to change the teachers' functions.

Role changes for teachers. Teachers seemed to be well aware that there is a lack of clearly demonstrable evidence that computers in education have been used effectively to improve the quality of instruction. Computer-assisted instruction is

unusually costly. It will not reduce the costs of the instructional budgets of school districts.[15] In order for computers to be more useful in public school instruction, the teachers' roles would have to be restructured. The major change would come in training teachers to produce and develop the software packages and programs to support computers in classrooms.

To begin to shift these functions, inservice education in computer-assisted instruction would have to be offered. Educational administrators have been lax in offering this form of inservice education because of expectations that reorganization and training in computer-assisted instruction would be resisted by teachers. This administrative expectation is probably valid since there appeared to be few incentives that administrators could offer teachers to develop curricular materials suitable for computer-assisted instruction.

Anastasio conducted an experiment using the Delphi forecasting technique with 35 experts in computers and computer-assisted instruction to discover further reasons for resistance of computers in education.[16] In addition to those already mentioned, restructuring of teachers' role, high costs, low efficiency, and insufficient curricular materials, the 35 experts were fully convinced that computers in education could become more productive if there were adequate theory developed to restructure both curricular and administrative decisions about computer uses. This appeared to be confirmed in the reactions of students to the educational uses of the computer.

Student resistance to computers. University instructors who have gained experience in using computers to instruct college students reported rather modest results because students generally had no prior experience in using the computer as an instructional device. Mohler reported after his experiments with using computers in medical education, he no longer felt that the entire instructional system of a school could be automated.[17] He suggested that some broad criteria for the selection of students who would use computer-assisted instruction should be developed to limit computer-assisted instruction to those students who had no prior experience. Further, he advanced and suggested the development of a beginning course for students which would include aspects of (1) hardware and programming, (2) systems and subsystems of information, and (3) systems of educational information. Students in these experimental courses did maintain enthusiasm for computers. They became better informed and more realistic in their attitudes toward computers. However, Mohler also reported that after the initial experiments of using the computer in medical education had subsided, the faculty members and the students lost interest in computer-assisted medical education. The manifestation of this disinterest was probably illustrated in polarizations among the students of the humanitarian-physician model versus the physician-scientist model. As computers become more widely used in education a similar conflict of values can be expected among the student-humanitarians and the student-technicians. They will disagree about the two approaches to their selected disciplines.

Other questions had been raised about the quality of student learning when computers were used. Selter claimed that students were more interested in the novelty of the computers than in the information imparted by them.[18] He also lamented the lack of adequate theory to assist both teachers and students to make better use of the potential of computers. Most instructors, Selter claimed, wanted to use the computer to impart facts to the students. When programmers attempted to illicit the facts to be imparted from instructors, they failed to do this. The best the instructors were able to identify were areas of instruction which the programmer, himself, had to investigate to obtain facts to be programmed for instructional use. Selter's final conclusion was that students learned very little from computer-assisted instruction. Instead, it was the instructor, himself, who had to reorganize his class material who learned more by using computers.

Administrator resistance. The disadvantages of computers to educational administrators are that data processing personnel use special, technical language which is unfamiliar to school personnel. These specialists with technical language also deal with the very center of the job of administrators, the allocation of resources, decisions about school personnel, and the implementation and evaluation of programs. Basically, the data processing specialists in education know very well these technical aspects of managing a school information, but they know little or nothing of the values operating in the system, the school

personnel, the curriculum, or the critical issues such as integration, sex education, or school politics. Data processing specialists need knowledge of these value and political problems in order to provide information for school officials.

But, the same is true for educational administrators. There is a great gap in the knowledge of administrators about computers. Exposure to knowledge about how computers can function in education seems necessary. Besides additional knowledge about computers, there are new applications for computers being developed by vendors and manufacturers. Administrators need to communicate with vendors about these new developments.

Administrators appear to resist automation because school personnel, teachers and other personnel enjoy working with people. They have to seek computer applications which allow school personnel a frame where they can function with computers in ways which were not too different from the time before computers.[19] Malcom et. al. finds that administrators need to have an understanding and some capability with computers, but their need is not for a purely technical understanding, it is a need for an understanding of what occurs to school personnel under the potential the changes wrought by computers.[20] Gruenberger agreed with this conclusion. He suggested that teachers, students, and administrators be given an inservice and work experience program with computers which would introduce them to computers before dehumanization shock sets in.[21]

Administrators should carry no more glib thoughts that computers would actually take over schools. There are new multi-

media training materials in a number of administrative areas, and there is further potential to develop administrative training programs in computers similar to the University Council on Education Administration's Monroe City Simulation and Special Educational Administration Simulation.[23]

A great deal of government moneys have been spent on computer uses in education. In six years, the U.S. Office of Education funded 500 projects involving tutoring, problem solving, gaming simulation, testing, vocational guidance, management, and organization. From 1966-1969, the U.S. Office spent $2.5 billion on computer based activities. Sidney Marland, former U.S. Commissioner of Education was optimistically cautious about the effects of computers in education. He stated:

> "I have no substantial doubts that technology will eventually succeed in education, but I would suggest that we must think very hard about the kind of success we are seeking..."[24]

Marland referred to the disillusionment and the quiet conflict about computers which seemed to be wide spread.

Some Systems Solutions to Conflicts over Computers

Ten years ago many would have accepted Marland's cautiously optimistic statement about educational technology and computers. While not entirely true, there were many cases where vendors and computer specialists led educators into making blind decisions about computers without considering the people, politics, or power involved. Computers treat information and cost-benefits in a school district in a precise way. They have led us into a period of elaborate study of school resources and the attainment of school objectives, but computers cannot deal with the value

and the decision-processes which lead to educational policy-making. In short, computers may very well lead us to more efficient educational programs and better use of economic resources, but they cannot assess the social value dimensions or the political aspects of school decisions.

A solution with value conflicts over computer use. The policy-making impact of computers in education is very real. The exactness of computers is unquestioned except when educators have to mix that exactness with the vague goals of school programs or the less rational political process that are both part of school decision-making.

McGivney and Bowles suggested a four step model which would help in reducing the disruption of computer-based decisions.[25] First, the school system would agree on a set of formal rules which separate the information power of the computers from the authority of the educational administrators to make decisions and establish school goals. Some of these rules would significantly separate the information power of the computers from the political considerations that are part of the educational administrators' decisions. Secondly, computer specialists and educational administrators must recognize that each school system has its own normal decision-making patterns. Each school system has set norms within which the computers would perform as decision tools. Hence in heavily political school districts, the use of computers would have serious limitations if its information power did not follow the customary political patterns. Thirdly, educational administrators must recognize that computers are not only precise, but they are also vehicles of power. Computers must be recognized as part of

the decision-making process and part of the objective substance as well. Both the decision-making potential and the political potential deserve more attention by administrators. Fourth, and finally administrators must recognize their power to reward or sanction people for their cooperation or recalcitrance with regard to computers. Rewards that administrators may use take the form of salary, status, or recognition; sanctions frequently are job loss, loss of pay, or status or recognition.

In summary, the model depicted in Figure 1 underscores steps to be taken when agreement cannot easily be reached on the goals of computers in a district. No matter what level, the educational administrators realize that no one person speaks for the district or can commit district resources to computers arbitrarily.

A solution when values are in agreement about computer uses. Most experts and practitioners agree that the best conditions for acceptance of computers is when school personnel agree on the computer uses in a school district. Gorham suggested that there were seven steps to reaching a policy decision when there are agreeable goals. These steps have been adapted to be applied to a decision to use computers in school districts.[26] First, the problems in the school system which could be solved by computers had to be identified. Secondly, a policy statement had to be formulated about the goals and objectives of computer use in the school system. Third, the administrators also had to propose alternative solutions to computer uses. Fourth, the administrators had to optimize the alternatives by placing them in a priority ordering. Fifth, the school system needed to select from among

FIGURE 1

Four Step Model to Solving

Value Conflicts Over Computer Use*

Step 1 - Schoolsystem agreement on rules separating information power of computers from authority of educational administration.

Step 2 - Recognition by computer specialists and by educational administrators that each school system has its own normal decision patterns.

Step 3 - Administrative recognition that computers are precise in information and part of the decision process.

Step 4 - Administrative recognition of the use of rewards and sanctions for cooperation or resistance to computers.

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*Adapted from McGivney, Joseph H. and B. Dean Bowles. The Political Aspects of P.P.B.S. "Planning and Changing" 3 (1): 6-8, 1972.

those alternatives. Sixth, the selected alternative needed to be legitimated and legalized by the administrators. And seventh or lastly, the administrators needed to implement the decision whether it included computers or not. Figure 2 illustrates the Gorham model.

Summary and Conclusion

Assumptions that there will be general agreement on the goals and objectives of using computers in school systems are probably neither correct nor even close to describing reality of system-wide decisions about computers. Disagreement over such decisions is probably the reason that make computers part of the political process in school districts. Such a political process will not be lessened or eased because of the two decision-making models that have been presented.

To educational administrators, this should not mean that computers in school systems should be abandoned. On the contrary, it should mean computers in education ought to be developed and employed to increase their impact on educational decisions. McGivney and Bowles further suggest that there are four fundamental modes for further resolving conflict over system-wide decisions about computers.

Rational search. If there is basic agreement as described in the Gorham model, then a rational and reasonable search for optimal computer use should bring the school districts toward a positive commitment.

Persuasion in computer use. If there is still basic disagreement on the use of computers by district personnel, but the power positions or the value positions of the participants are also

FIGURE 2

Seven Step Model When School Dirstrict Values are in Agreement About Computer Use*

Step 1 - Identify the school district problems that can be solved by computers.

Step 2 - Formulate a policy statement about the use of computers in the school district.

Step 3 - Propose alternative solutions to the use of computers.

Step 4 - Rank the solutions with and without computer use.

Step 5 - Select from among the alternatives.

Step 6 - Legalize the selected alternative.

Step 7 - Implement the decision whether it includes computers or not.

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*Adapted from Testimony of William Gorham before the Joint Economic Committee, Congress of the United States. "Hearings, the Planning, Programming. Budgeting System, Progress and Potential," 90th Congress, First Session, September, 1967, pp. 5-83

changeable, the educational administrators have a good chance to advocate the use of computers. Persuasion would be the best device in this case.

Bargaining with computer use. On the other hand, if the positions about computers are different among participants, but there are trade-offs or exchanges to be made between them. Then, decisions on computers could be made by bargaining or compromise.

Power plays with computers. When the objectives for computers are completely at odds among the district participants and they are neither changeable or negotiable, power politics comes into play. With power politics, the participants will not be persuaded about the use of computers nor will they negotiate. The conflict can only be resolved on a "win-or-loose" basis. In this situation, computers have very little usefulness and the only benefit is that one or another of the participants has a better awareness of what was won or lost.

In a final summary, this paper has tried to demonstrate that computers in education must have specific and systematic objectives. They must be better able to demonstrate better ways of allocating resources or making decisions. Planning for computers is also required, and both educational administrators and computer personnel must be aware of the political processes involved in introducing computers into school districts. If these personnel have some awareness that computers have serious consequences in the politics of school districts, then educational administrators and computer personnel should see a need to re-examine the assumptions of computers in education, and perhaps they can increase the potential of computers to improve education.

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